

## CLAIMS:

- 1 1. A method of etching substrates in a chamber having an internal surface,  
 2 comprising:  
 3 (a) introducing at least a first etchant into the chamber; and  
 4 (b) striking a plasma in the chamber to cause disassociation of the first  
 5 etchant, wherein the first etchant is selected to minimize deposition of a material on the  
 6 internal surface and wherein a first recombination rate of the disassociated etchant on  
 7 the material is substantially different than a second recombination rate of the  
 8 disassociated etchant on the internal surface.

- 1 2. The method of claim 1, wherein a deposition rate at which the material is  
 2 formed on the internal surface is less than about 30 Å/min.

- 1 3. The method of claim 1, further comprising:  
 2 (c) cleaning the internal surface prior to (a).

- 1 4. The method of claim 1, wherein the first etchant comprises chlorine.

- 1 5. The method of claim 4, further comprising:  
 2 (c) etching one or more layers from a substrate comprising silicon.

- 1 6. A method of etching a substrate in a chamber having an internal surface,  
 2 comprising:  
 3 (a) flowing at least a first etchant and a second etchant into the chamber,  
 4 wherein a volumetric flow of the first etchant is greater than a volumetric flow of the  
 5 second etchant; and

- 6 (b) striking a plasma in the chamber to cause disassociation of the first  
 7 etchant and the second etchant, wherein the disassociated first etchant deposits  
 8 material on the internal surface at a first rate and the disassociated second etchant  
 9 deposits material on the internal surface at a second rate less than the first rate.

- 1 7. The method of claim 6, wherein the first etchant comprises chlorine.

Sub 134  
Sub 137  
8. The method of claim 6, wherein the second etchant comprises bromine.

9. The method of claim 6, wherein the first etchant comprises chlorine and the second etchant comprises bromine. 112

1 10. The method of claim 6, further comprising:

2 (c) etching one or more layers from the substrate, wherein the one or more  
3 layers comprise silicon.

1 11. The method of claim 6, further comprising cleaning the internal surface prior to  
2 (a).

Sub 134  
Sub 137  
1 12. The method of claim 6, further comprising flowing oxygen into the chamber.

1 13. The method of claim 12, wherein the first etchant comprises chlorine and the  
2 second etchant comprises bromine. 112

1 14. A method of etching substrates in a chamber having an internal surface and  
2 minimizing the effects of the internal surface condition on an etch process, comprising:

3 (a) etching a first substrate in the chamber at a first pressure according to a  
4 main etch recipe; and

5 (b) etching the first substrate in the chamber at a second pressure less than  
6 about 30mTorr according to an overetch recipe.

1 15. The method of claim 14, wherein the substrate comprises a polysilicon layer  
2 disposed thereon and the overetch recipe comprises flowing one or more of a bromine-  
3 containing fluid, a chlorine-containing fluid or combination thereof into the chamber.

1 16. The method of claim 14, wherein (b) comprises flowing a chemical mixture into  
2 the chamber comprising a bromine-containing fluid and an oxygen-containing fluid,  
3 wherein the oxygen-containing fluid is about 10% or less of the volumetric flow of the  
4 chemical mixture.

1 17. The method of claim 14, wherein (b) comprises flowing a chemical mixture into  
2 the chamber comprising a chlorine-containing fluid and an oxygen-containing fluid,  
3 wherein the oxygen-containing fluid is about 25% or less of the volumetric flow of the  
4 chemical mixture.

1 18. A method of etching a substrate, comprising:  
2 (a) positioning the substrate in a chamber having an internal surface;  
3 (b) flowing a chemical mixture into the chamber;  
4 (c) striking a plasma in the chamber from the chemical mixture to form one  
5 or more plasma constituents, and  
6 (d) depositing a film on the internal surface;  
7 wherein a first recombination rate of the one or more plasma constituents with  
8 the internal surface is substantially equal to a second recombination rate of the one or  
9 more plasma constituents with the film.

1 19. The method of claim 18, wherein the substrate comprises polysilicon and  
2 wherein the internal surface substantially comprises quartz.

1 20. The method of claim 19, wherein the internal surface comprises a liner disposed  
2 on a chamber body.

1 21. A method of etching a substrate, comprising:  
2 (a) inserting the substrate into a chamber;  
3 (b) flowing a chemical mixture into a chamber, the chemical mixture  
4 comprising:  
5 (i) one or more of a bromine-containing fluid and a chlorine-  
6 containing fluid; and  
7 (ii) a fluorine-containing fluid;  
8 wherein a volumetric flow of the one or more of the bromine-containing  
9 fluid and the chlorine-containing fluid is at least 50% of the chemical mixture;  
10 and  
11 (c) striking a plasma.

1 22. The method of claim 21, wherein the fluorine-containing fluid comprises one or  
2 more of SF<sub>6</sub>, NF<sub>3</sub> and any combination thereof and wherein a volumetric flow of the  
3 fluorine-containing fluid is less than about 20% of the chemical mixture.

Sub 1 23. The method of claim 21, wherein fluorine-containing fluid comprises CF<sub>4</sub> and  
2 O<sub>2</sub> and wherein a volumetric flow of the fluorine-containing fluid is less than about  
3 50% and a volumetric flow ratio of CF<sub>4</sub> to O<sub>2</sub> is about 4:1.

1 24. The method of claim 21, wherein the fluorine-containing fluid comprises one or  
2 more of CF<sub>4</sub> and a volumetric flow of CF<sub>4</sub> is less than 50% of the chemical mixture.

1 25. The method of claim 21, wherein the bromine-containing fluid comprises  
2 hydrogen bromide and the chlorine-containing fluid comprises hydrogen chloride.

Sub 2 26. The method of claim 21, further comprising:  
2 (c) etching one or more layers from the substrate, wherein the one or more  
3 layers comprise silicon.

Sub 4 27. An apparatus for etching a substrate, comprising:  
2 (a) a process chamber including a chamber body having an internal surface,  
3 ;  
4 (b) one or more sources of one or more etchants coupled to the process  
5 chamber; and  
6 (c) at least one coil disposed adjacent the process chamber for striking a  
7 plasma in the process chamber by disassociating the one or more etchants, wherein a  
8 first reaction rate of the disassociated one or more etchants with the internal surface is  
9 substantially the same as a second reaction rate of the disassociated one or more  
10 etchants with a material formed on the internal surface during processing.

Sub 1 28. The apparatus of claim 27, wherein the substrate comprises polysilicon and  
2 wherein the internal surface substantially comprises quartz.

- 1 29. The apparatus of claim 27, wherein the internal surface comprises a liner  
2 disposed on the chamber body.

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